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Natural Resource Valuation Issues In Zimbabwe: The Potential
Applicability of Nonmarket Valuation Approaches

by

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The undersigned certify that they have read, and
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Abstract

Over the past two decades, ingenious techniques have been designed to measure in dollar terms, benefits and costs of nonmarket environmental goods. In North America, these techniques have been extensively used, whilst it is quickly becoming the case in Europe, but not in developing countries. In developing countries, their use have been limited to mostly World Bank funded evaluations of infrastructural investments.

The objective of this paper was to identify opportunities for the application of nonmarket valuation techniques in developing countries. The major issue was examination as to whether there was potential demand for monetary estimates of nonmarket environmental goods.

To achieve this objective, the paper contains a review of contingent valuation methods (CVM) studies carried out in developing countries and, using Zimbabwe as an example, contains an examination of the areas of potential demand. The focus of the paper was on CVM, because it has been widely used due to its flexibility.

The conclusion of the paper indicates that there is potential for applying nonmarket valuation techniques in developing countries. In addition to the traditional problems of reliability and validity, there were some special problems

which needed further investigation.   These problems include
currency issues, property rights regimes and the fact that
most people depend directly on natural resources for their
livelihoods.

Acknowledgements

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CHAPTER 1: INTRODUCTION

1.1. Background and Problem Statement

There has been significant progress during the past two decades in assigning economic values to nonmarketed goods. These methods have been developed and extensively applied in the industrialised world[1] (Mitchell and Carson, 1989, Carson et al, 1994). In the United States of America (USA), they have been accepted as evidence in court cases involving damage assessments (Kopp and Smith, 1993). However, these techniques are unfamiliar and have had limited use in developing countries (Whittington, et al 1990). This situation is not a coincidence and there are two equally important reasons for it. First, there are no generally accepted and tested methodologies for use in developing countries. This deficiency has led to recent calls for the further adaptation of the existing methods to meet the conceptual and practical difficulties of developing countries (Moyo, et al, 1992; Sinden, 1993).

The second equally important reason; the absence of a framework within which nonmarket valuation techniques can be operationalised. Where the framework exists, it is either weak or it has never been translated into action. Therefore, the point of departure for this paper is that without this framework, demand for such information may be nonexistent and hence the growth of application of nonmarket techniques may be

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[1] The popular methods used are the travel cost method, hedonic price method and the contingent valuation method. Travel cost method uses travel cost to infer value; hedonic model infers price indirectly from attributes of a good, rather than the good itself, whilst contingent valuation asks people through surveys, how much value they attach on a given resource, given that a market for that good existed.

limited. This paper focuses more on empirical issues, rather than theoretical. This emphasis does not mean that theoretical issues are not important, but that the research project may not even proceed if there is potentially no demand for such information. Therefore, theoretical issues will form the main focus in the next stage of this research.

In the developed countries, and the USA in particular, the application of nonmarket valuation techniques has been policy driven largely by legislation requiring mandatory environmental assessments. Even the few studies carried out in developing countries were policy driven through the World Bank and other donors. Though the focus of this paper is on Zimbabwe, it is anticipated that it will have important implications for other developing countries.

Benefit Cost Analysis (BCA), has become standard practice in both the private and public domain for assessing major development projects (or programmes). Its foundations are well known (Just, Hueth and Schmidt, 1983; Boadway and Bruce, 1984). The objective is to provide decision makers with best possible estimates of net benefits from the proposed development. Decisions to reject or accept the project may be based on whether benefits outweigh costs, if economic efficiency is an important goal. It is an important decision tool for assessing feasibility of projects, project rankings and optimisation of scale of projects. It thus, forces decision makers to set priorities and identify benefits and costs explicitly, thus making the justification for undertaking an activity more rigorously. BCA is based on economic efficiency , but does not supplant choices where other policy objectives are important, for example employment and distributional equity.

However, to operationalise BCA, there is need to obtain

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accurate values of the resources involved. For those products traded in markets, prices often can serve as value measures. However, there is a group of commodities which do not pass through markets. They include some environmental goods. They do not have market prices, hence in practice have been assigned zero prices or low values. Even when traded in conventional markets, prices do not reflect the true values of the various resources in question.

Lack of prices or inadequate prices, send wrong signals to resource users and managers resulting in resource misallocation. As a result, protection of such resources and decisions about their use are often inadequate or do not reflect the value society places on them (Adamowicz and Phillips, 1983).

This divergence between private and social costs or benefits have come to be known as externalities. These effects are difficult to monitor and estimate. This situation has led to recent calls to internalise such externalities into the accounting framework of both private and public decision makers (Munasinghe and Lutz, 1991). This internalisation is done through an extended BCA which takes natural resources into account in the decision process. Since natural resources have both a market and a non-market component, the challenge is to estimate and include values of the non-market components.

Where markets have failed, governments have traditionally instituted policy measures to correct the externalities. However, this action has led to a second form of failure which has come to be known as policy failure (or nonmarket failure), which has tended to reinforce market failure. This result has led to the current calls for policy reform that facilitates the operation of markets.

These issues require some objective measures of value which will contribute to better informed policies. However, the estimation of these values will not in themselves redress these externalities, unless informed policy interventions are instituted through reform of property rights and introduction of taxes, subsidies etc as policy instruments.

1.2. Research Objectives

The objectives of this paper are:
1. To provide the rationale and operational framework for the application of nonmarket valuation;
2. Identify potential problems in applying nonmarket valuation techniques in a developing country context; and
3. To identify areas for further research.

1.3. Organisation of Paper

The paper is organised around five chapters. Chapter One sets the background, problem statement and the objectives of the paper. Chapter Two contains a review of the main nonmarket valuation approaches; the Travel Cost Model, Hedonic Price Method and Contingent Valuation Method. This review looks at the approaches in terms of the theoretical underpinnings and discusses the strengths and weaknesses of each method. Chapter Three contains the context of natural resource valuation in Zimbabwe and including the main contentious issues confronting a valuation exercise. Chapter Four contains a review of past studies carried out in developing countries with particular reference to Zimbabwe in an attempt to evaluate the value of these endeavours. Last, Chapter Five contains a summary of the paper and highlights the main issues which require further research in a developing country.

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CHAPTER 2: NON-MARKET VALUATION APPROACHES

This chapter contains the various theoretical models used in benefit estimation, their theoretical and practical underpinnings and their strengths and weaknesses in valuing various resources.

2. Theoretical Models

Several methods exist to measure non-market values. They fall into two broad categories depending on whether they are direct or indirect methods. The most popular direct method is the contingent valuation method (CVM). The most popular indirect method is the Travel Cost Model (TCM) followed by the Hedonic Price Model (HPM). The indirect methods exploit weak complementarity between environmental goods and market goods (Rosen, 1974). They estimate the trade-offs between market goods and environmental services in an attempt to reflect the demand for such services (Adamowicz, 1991). Whilst these methods share many conceptual underpinnings, they have different applicabilities, strengths and weaknesses.

2.1. Travel Cost Method

The TCM was developed to estimate economic values that people place on recreational sites. This method was proposed by Hotelling in 1947 to the US National Park Service (1949). It was further developed by Clawson (1959) and Clawson and Knetsch (1966). Since then, it has found extensive use in developed countries for the past three decades (Richards and Brown, 1992;Walsh, 1986; Rosenthal et al,1984).

The TCM is premised on the assumption that people live in different locations and thus incur different travel costs to reach a particular recreational site. Due to this cost

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difference, they are expected to visit a particular site at different rates. In this case travel cost (TC) is taken as a proxy for market price, since it is hypothesised that demand for a site decreases with distance. Therefore the observed trip expenditure is used as a proxy for market price.

A number of assumptions underpin use of TCM. First, individuals are assumed to regard changes in TC as they would entrance fees. Second, it is assumed that only one site is available to that individual in the defined study area. Third, the sole purpose of the trip is to visit the site (include only costs incurred in visiting that site). Fourth, all individuals spend an equal amount of time at the site. Finally, no utility is gained in actual travel (Coyne, 1990).

There are two stages involved in using TCM. First, the demand function for the site is specified. This relates visits to travel cost and other socio-economic variables. Second, consumer surplus associated with visiting the site is estimated by mathematically integrating the demand function (Clawson and Knetsch, 1966).

Data can be analysed as zonal or aggregated (Clawson and Knetsch, 1966), and individual or disaggregated (Fletcher, et al 1990). Zones are defined as concentric distances from the recreational site. Zones will be the unit of analysis. The assumption is then made that people originating from each zone face uniform travel costs and socio-economic characteristics to facilitate aggregation of benefits. The behaviour of the number of trips measured as trips per capita from each zone with respect to TC are used to derive the demand function for each site.

The observed total visitation for the site from all TC zones

at prevailing site entrance fees represents one point on the demand curve. The demand curve is constructed by varying TC. Visits are summed across zones to determine the predicted total visitation of the higher hypothesised entrance fee until full demand curve is determined (Coyne, 1990). The general model which is estimated is of the following form:

$$V=F(TC, S, e)$$

where V is number of visits by an individual to a site, TC is travel costs from zone to recreational site (round trip), S is a vector of socio-economic variables (Age, income) and e is an error term.

The success of such an aggregation approach depends on the definition of the zones which depends on the extent to which the uniformity assumption is met. Often, there is an uneven population distribution and varying access quality from a given site to various origin zones (Richards and Brown, 1992) Therefore zones must be delineated such that there is sufficient variation across zones in the variables affecting demand and costs to allow for reliable statistical estimates of demand. They should be large enough and cover areas with relatively uniform characteristics to reduce bias. A number of other problems; time costs, multiple destination trips (joint costs), benefits associated with the actual travelling have been dealt with extensively by others (Cesario and Knetsch,1976; Haspel and Johnson, 1982).

To reduce the effects of aggregation, some authors have proposed use of individual trip data with the individual being the unit of analysis (Brown and Newas, 1973; Brown et al. 1983). Measures of use become visits per household and costs incurred in terms of money and time can be incorporated in the analysis. This method has its own share of problems which have been dealt with in the literature, biases due to disaggregation, truncation (excluding zero visit zones).

The values obtained from the traditional TCM are site specific
and ignore temporal site quality changes (Adamowicz, 1991).
However, economists have developed a number of variants to
deal with site quality changes. They include the varying
parameter model, the hedonic travel cost model and the random
utility model. The Varying Parameter Model (VPM) follows the
basic model specification, but differs in the analytical
process. Instead of regressing number of trips on the TC and
the socio-economic attributes, the VPM examines across sites.
The model is of the following form:

$$Vi=ai + biPi$$

where V is number of trips and P is the travel cost and i=
sites 1 through n. In the second stage estimation, ai and bi
are regressed against quality attributes from the sites
producing a systematic parameter variation. The problem with
this approach is that the underlying behavioural model is
unclear and depends on the choice of the researcher.

The hedonic travel cost model (HTCM) assumes that an
individual is willing to pay more in TC to visit sites with
higher quality (Brown and Mendelshon, 1984). Estimation
techniques are used to derive an implicit price of quality
attributes (change in TC attributable to a quality change)
from information on site attributes and individual choices.
The main disadvantage is the problem of defining site and
potential negative prices (Smith and Kaoru, 1987).

The most promising approach is the dichotomous choice or
random utility model (RUM). If site A is chosen when site B
was available, then utility gained by going to site A is
higher than if B was chosen. Site selection is a function of
site attributes and socio-economic characteristics. This
situation is consistent with notions of utility, and thus can
determine CV and EV directly from the estimated model
(Adamowicz, 1991). It assumes that trip choices are made

independently over the season. The TC and available attributes information are used to describe the choice in a discrete choice statistical framework. This model is able to take account of substitution of sites and model complex behavioural processes (nested choice processes). A certain distribution for the stochastic element is chosen to enable estimation of the parameters of the utility function. This function can be used to predict choices and evaluate welfare measures.

The advantage of using TCM is that value estimates are derived from actual past behaviour rather than attitudes or intentions. It also provides a behavioural model and a set of testable hypotheses (Adamowicz, 1991). However, one of the problems is that since the model is specified by the researcher, it may not accurately reflect the actual underlying behaviour. In addition, TCM can only estimate user values associated with use of the resources. TCM can be used to estimate values associated with recreation. There are several recreational destinations including Great Zimbabwe, Victoria Falls, Lake Kariba and a network of National Parks.

2.2. Hedonic Price Model (HPM)

This approach determines values through tracing implicit effects of environmental quality on market transactions. These data are actual past data on market prices and levels of market and non-market attributes. It attempts to identify the contribution of market and non-market aspects of a particular good to market price. For example, the value of a residential housing includes the contribution of market goods (square metres, fireplace, size of stand) and surrounding environmental conditions (air quality, noise levels etc). The attributes become the arguments in the individual's utility function rather than the good per se. The model can be

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specified by:

$$Py=f(Z1y,....,Zny)$$

where Py is the price of the good y (y=1,....Y) and Zjy is the level of attribute j (j=1,.....n). The implicit price of an attribute is derived by statistical means. If the attribute is continuously measurable (quantitative), then respective partial derivatives represent the implicit marginal attribute price. However, if the attribute is qualitative, then displacement of consumption occurs and estimates measure the impact of the presence of the attribute represented by the variable (Oczkowski, 1994).

This method has primarily been used to value air quality on urban property values (Harrison and Rubinfeld, 1978; Rosen, 1974; Freeman, 1979). Other applications have been in valuing quality attributes of inputs (Veeman, 1990). Some of the assumptions underlying the analysis are; demand functions for characteristics are stable during the subperiod(s) under study, and that variations in prices and associated qualities of characteristics within these subperiods are generated by variables in the supply of characteristics rather than by shifts in the demand for characteristics. This method may have limited application in a developing country where markets are inefficient and data limiting.

2.3. Contingent valuation Method (CVM)

Contingent valuation solicits information by directly questioning a sample of respondents about values they attach to an increase or decrease in a quantity or quality of a good, contingent upon a market (Mitchell and Carson, 1989). Respondents reveal their willingness to pay (WTP) or willingness to accept compensation (WTAC) if a market for the good existed. WTP denotes payment for an increase in the quantity of the good, whilst WTAC denotes accepting

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compensation for foregoing or putting up with a decrease in the quantity of the good.

CV has had more difficulties in being adopted than TCM because it is associated with a voting paradigm which was not comfortable to most economists (Hanemann, 1994). Some other economists believed that only market generated choices were true reflections of consumer preferences. However, whether the market is real or experimental is immaterial. With experimental settings there is a need for careful design of surveys, which require expertise outside economics. Undoubtedly, survey context determines responses.

CVM must establish baseline conditions with respect to the availability of non market values and clearly describe the institutional and structural framework which regulates access to and use of the resource. It must characterise the changes that will result from the policy alternatives and through creating a hypothetical market, it must attempt to accurately capture the respondents WTP/WTAC. As well, it must outline the conditions for provision of environmental improvements and the payment method. The quality of the results depend on the characteristics developed within the contingent market.

Essentially CVM elicits ex ante valuations of policy impacts. CVM format describes the policy change and defines the contingent market or policy choice mechanism. Thus respondents make choices in a carefully structured context.

CVM has been extensively used in developed countries to estimate the value of environmental and public goods (Carson, et, al, 1994; Mitchell and Carson, 1989; Sinden and Worrell, 1979; Cummings et al.1984). CVM was first suggested by Ciriacy-Wantrup in 1952 and first applied by Davis (1963). Since then a plethora of research activities have occurred

focusing on the use of the CVM and improving its effectiveness. In a recent survey of CVM applications, Carson et al. (1994) cite 1600. This is by no means exhaustive, hence the actual numbers may be higher. Its use has ranged from recreational values (Davis, 1963; Sellar et al.1985), wilderness use and preservation (Gilbert et al. 1992; Walsh et al. 1984) and wildlife and harvesting (Bishop and Herbelien, 1979). Thus, CVM has proved to be an effective and flexible means of valuing a wide range of environmental goods (Smith, Desvousges and Fisher. 1986).

A number of approaches have been devised to frame the contingent valuation questions. Question formats determine the method of analysis. A question format can be one of three basic types. First, the open-ended CVM, where respondents are asked their maximum WTP for the use of a given resource. Respondents give the dollar amounts they are willing to pay or accept as compensation. However, this approach has problems in that it assumes a respondent is able to give a reasonable dollar value.

Certain elements in CVM may make the value formulation problem difficult. For example, CVM is likely to be applied to policy scenarios which are unfamiliar to citizens (Hoehn and Randall, 1987). This situation can be serious especially in developing countries where respondents are used to handling low and erratic cash flows and the concepts of WTP or WTAC may be foreign.

An alternative to the open-ended referendum is the iterative bidding game where respondents are asked for a yes or no response to a specific bid amount. If the respondent say "yes" , then the amount of the bid is raised until the person's maximum WTP is reached. If the respondent say "no" , then the amount of the bid is decreased until the person's maximum WTP is reached. Iterative bidding may be suitable in

areas were people are used to bargaining in the market place. Examples are countries in West Africa (Boadu, 1990).

A third format is the dichotomous choice CVM (DC-CVM) approach (also known as closed-ended referendum). Its use has grown in popularity since the pioneering work by Bishop and Heberlien (1979). Since then, numerous applications of DC-CVM abound (Carson, et. al 1994; Mitchell and Carson, 1989; Cummings, et.al,1984;). Recently, two distinguished Nobel laureates, Robert Solow and Kenneth Arrow, recommended to the National Oceanic and Atmospheric Administration of the United States of America, in the use of CVM in damage assessment. They recommended the use of DC-CVM, face-to-face interviews and the intertemporal repetition of the sampling procedure to verify stability of welfare measures.

The use of DC-CVM has several advantages. It combines some of the better features of both open-ended and iterative bidding. Referendum surveys involve establishing attributes of a good or resource and then asking whether the individual would pay or accept a specified amount of money for access to that resource. The individual is faced with a single specific bid amount and gives a yes or no response. This bid is varied systematically across respondents (Bishop and Heberlien, 1979, 1980; Boyle,Bishop and Walsh 1986).

Furthermore, it mimics market conditions where an individual is confronted with the decision, "to buy or not to buy" (Bishop and Heberlien, 1979). In this case a hypothetical price is offered to which the respondent decides to "take it or leave it" (Mitchell and Carson, 1989). This approach reduces the occurrence of strategic bias which is inherent in open-ended referendum (Loomis, 1990) and the burden of coming up with a dollar amount. WTP is found by finding the relationship between amount of bid level respondents are asked

to pay and the probability of their responding yes to that amount. The WTP measure is obtained by mathematically integrating the bid curve.

CVM has some notable advantages over other methods because it is easily administered and relatively free from restrictive assumptions (Adamowicz and Phillips, 1983). It may be the only method available in certain situations (Hoehn and Randall, 1987). First, where markets suitable for indirect approaches do not exist (eg existence and option values, and spiritual values). Second, where policy options to be considered are outside the range of available data. Third, where past market transactions fail to reflect current information concerning environmental quality, substitutes or hazards.

CVM has been shown to be potentially very useful for valuing demand for nonmarket goods. A body of evidence exist which is supportive of the reliability and validity of CVM results (Cummings et al. 1984, Mitchell and Carson, 1989). In addition, empirical studies have shown that CVM results are systematically related to individual socio-economic characteristics as well as to the availability of substitutes and complements (Brookshire, Ives and Stoll, 1980; Daubert and Young, 1981, Shyamsundar, 1993).

Despite the overwhelming supporting evidence, debate on several issues continue. These issues relate to the reliability and validity of CVM results which are questioned on the basis of inherent biases. They cast doubt on the efficacy of CVM results. Several studies have shown the unexpected disparity between WTP and WTAC (Knetsch and Sinden, 1987; Knetsch, 1990) when theory suggests that they are equal (Willig, 1976; Randall and Stoll, 1980). Therefore, vigorous debate goes on with respect to alternative elicitation

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procedures and artificial market structures or payment vehicle (Mitchell and Carson, 1989). These issues are discussed in Chapter Four in relation to the review of CVM studies conducted in developing countries.

2.4. Summary

This chapter has contained a description and discussion of the models used in benefit estimation; TCM, HPM and CVM. All models are based on similar foundations of consumer choice theory. The first two use actual data on past behaviour to infer value, whilst CVM uses direct questioning of respondents to reveal their value of a resource. Each method has its strengths and weaknesses. Overall, TCM and HPM can only value use values, whilst CVM can also value nonuse values.

CHAPTER 3: NON-MARKET VALUATION ISSUES IN ZIMBABWE: AN OPERATIONAL FRAMEWORK

The previous chapters have provided the foundation and justification for nonmarket valuation. The objectives of this chapter are to describe the institutional framework which determines resource use in Zimbabwe. It identifies the main issues surrounding natural resource use and management. Demand for nonmarket goods has been shown to be policy driven. Thus, the chapter contains an attempt at providing an operational framework for the application of nonmarket valuation techniques in Zimbabwe.

3.1. National Economy, Resources Ownership and Use Patterns

Zimbabwe lies within the Tropics. However, with an altitude varying from 600 - 1200 metres above sea level, most of the country can be classified as subtropical. Its population is estimated at 10 million growing at 3% per year (CSO,1993). Over 60% of the population is rural. It is classified as a middle income developing country by the World bank.

The country has a diversified economy based on both primary production and manufacturing. Mineral resources contribute 7% of GDP annually, 6% of employment and 30-45% of foreign currency (Muir, 1993). Industry is well developed and diversified producing a wide range of products. It contributes 25% to GDP and 16% of wage employment.

Though agriculture accounts for 10-14% of GDP, it is a major source of employment and foreign currency and has a major impact on growth through linkages with the rest of the economy. Of all manufactured goods, 25% fall under food, drink and tobacco products, whilst 40% of inputs originate from the agricultural sector.

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The country is divided into five agro-ecological zones called Natural Regions (NR). They define the agricultural potential of the country. They range from NR I to V with agricultural potential decreasing in that order (Table 1). Tenure categories and land ownership reflect the historical inequitable land distribution, which was based on racial discrimination (Table 1).

3.1.1. Resource and Population Distribution

Natural Region 1 is a specialised and diversified agro-region. It receives consistent rains over 900mm per year. Natural Region II is an intensive region, receiving rainfall averaging 750 - 1 000mm per year. Natural region III is a semi-intensive region, receiving between 650 and 750 mm of rain per year. Rains are not reliable and the region is subject to mid-seasonal drought spells. Natural Region IV is a semi-extensive farming region receiving between 450-650 mm of rainfall per year. However, the rains are infrequent, unreliable and is subject to severe mid-season drought. Last, NR V is an extensive farming region based on livestock production because crop production is a risky business unless under irrigation. Rains are very erratic and are below 450mm.

The farming sector is made up of five subsectors; the Large Scale Commercial Farmers (LSCF), the Small Scale Commercial farmers (SSCF), the Resettlement Areas (RA) and the Communal Areas (CA). The LSCF, formerly the European areas, consist of about 4,660 large commercial farms with full title to land on 11.2 million hectares with an average farm size of 2 406 hectares. Most of the land is located in better agro-ecological regions (Table 1). This sector accounts for 29% of the total land area of the country. Ownership by Government and cooperatives make up 4.7%.

Table 1: Land Redistribution by Natural Region and Ownership Patterns (%)

Natural Region	Av. annual Rainfall mm	Commercial (LS &SS)[2]	CAs & RAs[3]	DNPWM [4]	Forestry	Total
I	> 1000	64	19	7	10	1.8
II	750-1000	77	21	.5	.5	15
III	650-1000	52	39	7	2	18.6
IV	450-650	29	50	17	4	37.8
V	<450	36	46	17	1	26.7
Total		40	45	13	2	100

Source: Muir (1993).

The SSCF, formerly the African Purchase areas, accounts for 1 238 700 hectares located mainly in NRs II and III (35.4%) and IV (38.2%). This sector represents 11% of the total land area. In 1983, the sector was made up of 8 653 farms on an area of 1,074,767 hectares'

The CAs account for 16.4 million hectares or 42% of land in Zimbabwe. Of this total, 74.2% of the land is located in the poorest rainfall zones of NRs IV and V. The total CA population in 1992 was roughly 5.1 million people, which is 70% of the national population, with a density of about 31.1 persons per square kilometre (CSO,1992). However, about 60% of the rural population lives in Natural Regions IV and V which are considered marginal for agriculture. These areas are

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[2]LS is large scale commercial sector and SS is small scale commercial sector

[3] CA is communal area and RA is resettlement area

[4] DNPWM is the Department of National Parks and Wildlife Management

characterised by poor social and economic infrastructure, low agricultural productivity due to poor soils, low and erratic rainfall averaging 450mm per year and subject to mid-seasonal droughts. Crop production is thus a risky undertaking. This situation is exarcebated by inadequate capital to purchase inputs, labour, draft power and crop technologies suited to drier regions. The economy is based on both subsistence and commercial production, the latter becoming increasingly important in some areas (Stanning, 1985; Rorbach, 1989).

The resettlement program was implemented to redress past inequities in land distribution. It was originally conceived to resettle eighteen thousand families on about 1.2 million hectares of land previously owned by White farmers. This number was raised to 162 000 families on 10 million hectares of land in 1982 (TNDP, 1982). With the 1992 Land Designation Bill, it is envisaged that five million hectares of land will be acquired to resettle more families.

Distribution of natural woodlands follows the same pattern with land ownership described above. The nature and character differ from one area to the other reflecting the ownership pattern and population pressure (Whitlow, 1988). They range from dense forest cover in state and private lands, to shrubland in CAs.

There are various estimates of woodland area. They vary due to method of measurement, definitional and the fact that they are dwindling at about 70 0000 to 100 000 ha per year due to agricultural expansion (Moyo, 1992). Woodlands in communal areas and LSCF area cover an area of 10 million hectares, making up about 63 % of the total. Woodlands in communal areas are made up of remnants of scattered trees which are mostly used for timber, fuelwood and nontimber forest extraction.

Woodlands in LSCF areas cover 7 million hectares making up about 50% of the total. These are still relatively undisturbed and constitute about 17% of commercially productive indigenous forest. They form an important habitat for wildlife.

Woodlands and forests on state lands and in protected areas account for the balance of 6 million hectares. This is divided among National Parks and Wildlife and Forest Commission. The Forest Commission (FC) is a state agency responsible for managing state forests. The Department of National Parks and Wildlife Management (DNPWM) is another state agency responsible for providing reserves and sanctuaries for the management of flora and fauna.

3.2. An operational Framework for Natural Resource Valuation

Freeman (1993) gives three criteria which any measurement technique should satisfy. The first is that the framework should be consistent with standard economic theory of individual preferences and measurement of welfare changes. The second is that the theoretical framework and measurement techniques derived from the framework should be capable of reproducing what would be revealed as values by a well-functioning market for the resource, if such a market existed. The third criteria is that the theory and measurement technique should be resource specific i.e. refer to a specific site, species, ecological system rather than directed to general attitudes towards environmental protection and preservation. Demand for nonmarket environmental goods and hence the application of the methodology to capture them are demand driven, they rise with economic development (Barbier, 1991). There is agreement on this issue by both local (Bruce, et al 1993, Bojo, 1993) and international (Kopp and Smith,

1993) commentors.

Bojo (1993) provides an operational perspective for woodland valuation in Zimbabwe. This perspective includes land valuation for resettlement, land use decisions for the State Agencies, land taxation and national accounting. However, this framework is partial in that it only provides the rationale for valuation. This paper will go further by putting this perspective into a broader framework which may drive demand for the inclusion of nonmarket techniques in an extended BCA. In addition, it will demonstrate the importance of economic values in decision making.

3.2.1. Nonmarket valuation and natural resource utilisation.
The fact that forests provide a variety of goods and services is widely recognised. Besides timber products, they provide nontimber products such as wild foods, medicines, wild animals, browse for livestock and wildlife, recreation as well as environmental service functions of biodiversity, erosion control, nutrient recycling and water flow regulation. However, past research and policy programmes have emphasised industrial timber production and fuelwood harvesting (Katerere, 1986; Dewees,1989) and neglected the role of the other non-timber resources (Moyo et al. 1992; Muir, 1989). Bojo (1993) provides four levels of analysing nontimber products.

Direct, local private goods
Direct local private goods include fruit, fuelwood, construction wood, wild foods. Available evidence suggest that these nontimber resources contribute significantly to household incomes and welfare (Murindagomo, 1988; Chimedza, 1989; Campbell et al., 1991), The livelihoods of these households may be threatened by policy changes which reduce access to these resources. However, the magnitude of these

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values and their relative contribution to both the household and national economies has not been measured and is little understood. As a result, their value may be underestimated thus resulting in their overexploitation or misallocation, thus creating resource conflicts. This depletion has led some authors (Muir,1989; Moyo, et al 1992) to call for research into the potential contribution of non-timber resources to household welfare.

Indirect, local private goods
Indirect, local private goods are obtained in terms of nutrient recycling, fodder and browse. Probably fodder and browse are the most important products provided via use by cattle which are an important component of the communal farm sector. Cattle provide draft power, milk and manure. In the case of LSCF areas, browse is also important to both cattle and wildlife, the latter of which is becoming one of the fastest growing industries in the country (Jansen, 1992; Muir, 1993).

Indirect, regional semipublic goods
Indirect, regional semipublic goods include soil retention, stream flow regulation and tourism. Forest commission estates and national parks were originally reserved with that in mind. They were preserved because they are sources of the major rivers. The conventional wisdom then was that they acted as storage of water and regulated stream flow. If these forests were destroyed, the wisdom went, then there will be a decrease in stream flow in terms of both quantity and the number of months it will actually flow. However, these claims are not backed by empirical evidence, there is no data on ecological value of woodlands especially given that state forest were established to conserve catchments (Bojo, 1993).
Adamowicz (1992) argues that nontimber values are also important for identifying the regional distribution of the

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services associated with the values and the regional economic impacts. Individuals incur costs while using nontimber resources and although different from measures of value, expenditures are important from a regional perspective. Available estimates put the contribution of forest products to 3% of GDP (Mujakachi, 1993; McNamara, 1993). Tourism, especially international tourism is a major source of foreign currency. It is third after agriculture and mining. In fact it is the fastest growing sector in the economy, especially wildlife based tourism, and the trend is expected to affect significantly landuse patterns in both state, private and communal areas.

In semi-arid areas, wildlife is thought to be a more sustainable and profitable alternative than conventional agriculture. The most lucrative is photographic safaris and safari hunting. Areas where wildlife is abundant, are conducive to the establishment of commercial ventures, but do not require major capital investments by the landowners.

Indirect, global public goods

Indirect, global public benefits include carbon sequestration and preservation of genetic diversity. The possibility of Global warming has been linked to emission of greenhouse gases especially carbon dioxide (CO_2). Forests are thought to act as carbon sinks, reducing the levels of carbon dioxide in the atmosphere. Bojo (1993) did some analysis of carbon sequestration capacity of Zimbabwe woodlands. He concluded that they have low static and dynamic storage capacity.

Forests preserve biodiversity which contributes to important material for plant breeding, insecticides and pharmaceutical products. However, Zimbabwe may not have the same diversity of species compared to some tropical country, but the value of the species may be unique.

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3.2.2. Nonmarket Valuation and Environmental Impact Assessment

Estimation of nonmarket values has become important especially for developing countries like Zimbabwe. The government is committed to both development and environmental goals. However, development-environmental trade-offs are expected to widen in the long term, given the increasing demand on land from population growth and in the short term, the effects of the Economic Structural Adjustment Programme (ESAP)[5]. Striking a balance between these goals becomes a policy challenge. Therefore, there is need to provide information on the relative costs and benefits of various options available in meeting both development and environmental goals, otherwise environmental goals will remain only policy ideals.

To achieve these goals, the government has set out guidelines for mandatory environmental impact assessment (EIA) on all major projects which are likely to impact adversely the environment. EIA is defined as " a procedure for assessing environmental implications of a decision to enact legislation, to implement policies or plans, or to initiate development projects, and the conveying of this information at a stage when it can materially affect their decision, to those responsible for sanctioning the proposal" (Wathern, 1988).

The International Commission for Environmental Assessment (ICEA, 1990) carried out a review of the legislation and the potential role of EIA and recommended guidelines for EIA legislation. These guidelines make an EIA mandatory for any development in the following areas;

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[5] This reform programme involves downsizing the public sector. The retrenched workers would then go back to their rural homes, where they would seek land to sustain themselves.

a) large water developments
b) all industrial projects
c) new settlements and urban expansion
d) roads, airfields and pipelines
e) irrigation, forestry and plantation agriculture development
f) any of the above categories of projects where the site encompasses a protected area

The Ministry of Environment and Tourism will co-ordinate the implementation of these procedures, with the power to veto if guidelines are not being adhered to. This may provide the policy context for nonmarket valuation and the legal teeth to ensure that nonmarket values are included in any BCA. The following section describes some projects which are underway and how nonmarket valuation can be undertaken in tandem with the EIA process.

Water and Industrial Projects
Due to the recurrent severe droughts, water development projects are getting serious policy attention. For example, there are plans to divert water from the Zambezi River (a shared water source by three other countries) to supply water to Bulawayo, the second largest city. It is envisaged to construct a pipeline to transport water over a distance of 400km, passing through several communal areas. Other water projects include the Osborne Dam which is under construction and the recently approved Pungwe Dam meant to supply water to Mutare. Except for the Pungwe dam, EIA was undertaken for the other two projects. These projects involve some displacement of people and major changes in landuse.

Settlements
The government is committed to redressing the historical inequalities in land ownership through land reform. It intends to purchase more than 5 million hectares of land from

the LSCF sector and redistribute it equitably to the majority
of smallholder farmers. It intends to introduce a land tax as
an instrument of encouraging efficient land use.   There has
been an outcry on how the government is going to value the
land and on what basis it is going to tax the land.   In
addition, critics argue that this will lead to increased
deforestation and soil erosion which have long-term impacts on
growth. It may lead to a decline in the quantity and quality
of wildlife habitat, which is a major source of revenue from
hunting and tourism.

Whilst both sides have legitimate concerns, the problem is on
how to value the natural woodland. The Land Acquisition Act,
the instrument meant to enable this land reform, is the first
act which stipulates acquisition of land for forest purposes,
the utilisation of wildlife and other natural resources.   It
further stipulates compensation (valuation) of woodland
resources.   Originally, land was valued for its arable and
grazing potential, without valuing the woodlands for their
varied goods and services.

Project area is protected and unique
There are several mining explorations going on in the country,
especially in National Parks areas.   Mobil Oil Company is
prospecting for oil in the Mana Pools National Park, one of
the World Heritage Sites. It has a unique habitat and varied
flora and fauna. It is the subject of controversy between the
government   and   environmentalist   (both   local   and
international). The government is keen on the project because
it has prospects of reducing the heavy import bill of oil
which uses scarce foreign currency reserves. Environmentalists
argue that the area is more valuable as a tourists attraction.
They point out that in the long term tourism is going to be
more profitable than oil, which may bring short term benefits.
Though an EIA was carried out, it was never made public.

Since EIA is mainly concerned with measurement and prediction of physical impacts, the role of nonmarket valuation becomes imperative in translating these physical impacts into economic impacts. Adger and Chigume (1991) show in the case of the Osborne Dam the potential role of nonmarket valuation especially CVM in assigning economic values to project impacts (Table 1)

The proposed EIA legislation could provide the operational framework for nonmarket valuation and the impetus for the incorporation of economic value of natural resources into public decision making. The Ministry of Environment and Tourism, with this mandate and the power of veto can spearhead this process. This situation may catapult the further modifications of existing approaches to suit the local circumstances.

3.3. Role of economic values

What is the motivation for getting economic values?. Getting values in itself, without using them is irrational. Economic value is important in that it gives a measure of the opportunity costs of different land uses, thus aiding policy in land use decisions that contribute to sustainable use of resources.
This information can be used in several ways. At the household level, valuation can be used to reveal insights into people's behaviour and motivations in utilisation of forest resources and their response to deforestation. For example, one could estimate the benefits which smallholder farmers derive from resources in the communal woodland and on state and private land which border communal areas. These conflicts arise due to different motivations for resource use. These motivations include commercial, aesthetic, subsistence and ecological.

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Table 2: Major Identified environmental impacts of the Osborne Dam

Major impacts	Environmental impact, measurement or description	Economic appraisal and measurement
Bush clearance and loss of habitat	Number of species affected, hectares of particular habitats	Shadow projects to replace habitats
Erosion potential	Tonnes of topsoil lost	agricultural productivity or water quality
Inundation of land	Number of hectares, physical description	Agricultural production loss
Eutrophication risk	Concentration of pollutants, probability of impact, profile	Economic impact on fisheries
Bilharzia/malaria risk	Number of potential cases per head of population	Increased costs to health services
Salination risk	Concentrations, area affected, time profile	Loss in productivity or costs of reclamation
Displacement and resettlement of people	Number of people, community structure	Willingness to Accept compensation, relocation costs
Loss of cultural, social, religious values	Consultation with locals	Potential CVM
Loss of educational and community infrastructure	Miles of road, number of buildings	Replacement costs
Loss of ancestral shrines and land	Consultation with locals	Potential CVM
Disturbance of social cohesion	Consultation	Potential CVM
Increased pressure on land and grazing	Human population per unit area, livestock numbers per unit of area	Costs of potential erosion in opportunity cost or replacement cost
Improved options for industrial, urban and rural development downstream of dam	Prospective companies involved, potential magnitude of pollution	Expected income increase and multipliers
Tourism potential	Number of tourists, likely marketed and nonmarketed activities	Expected income and multipliers. TCM, CVM

Source: Column 1 and 2- ICEA (1990), column 3- Adger and Chigume (1992)

Economic values will reflect these motivations. Some form of resource sharing schemes or compensation can be arranged. The major issue confronting nonmarket valuation techniques is on how far they can help in the generation of information that may lead to the resolution of resource management conflicts.

3.3.1. Rural development and investment

There is little understanding of the investment behaviour regarding tree planting by rural households. The World Bank which supported Rural Afforestation Programme invested a lot

of money in efforts to reforest by planting eucalyptus trees. Unfolding evidence suggest that this was done with little understanding of the needs of the rural households (Muir, 1991). Nonmarket valuation research will fill this gap by providing the linkages, both of a complementary and competitive nature between agriculture and trees.

There is an increasing number of farmers in the LSCF sector who are raising wildlife on their farms. They cater to hunting safaris, wildlife viewing by tourists and slaughter for sale in local and international markets. Studies are underway, both by individual farmers, DNPWM and WWF to investigate the optimal combination of wildlife and cattle. To do so requires information on the value of the wildlife, to calculate the effects of marginal changes to profitability. Nonmarket valuation can contribute to this effort by providing estimates of wildlife values.

3.3.2. Land use plans or changes by state agencies
The Forestry Commission is faced with designing an optimal management plan that maximises net social benefits from both timber and non-timber resources. However, FC is faced with lack of, or inadequate information, on forest land values except from commercial timber. Even the timber values are underestimated (Mujakachi,1993). Bojo (1993) argues for a valuation that includes changes in water flow patterns and/or changes in soil erosion and siltation.

3.3.3. Compensation
Developers can be forced to compensate those displaced by development and bear the costs of replacing the lost outputs, both marketed and nonmarketed. The issue of compensation is critical within the land reform programme and compensation for loss of land in the communal areas, where a development project displaces people or restricts access to a certain

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resource such as establishment of a park or reserve. Currently, the DNPWM is having problems finding the basis on which to compensate rural households on losses incurred by wild animals. WTAC could be an alternative method to use in assessing damage for compensation purposes.

3.3.4. Policy reform
The current thinking is that operations of markets can be improved through policy reform. The reform process will be aimed at internalising the externalities. For example, changes in ownership and property rights. In the case where property rights cannot be reformed due to the nature of the resources or some social constraint, the reform can be achieved indirectly through creation of markets for resource use rights (pollution rights, grazing rights).

3.3.5. National accounts
Another area where economic value may be important is in operationalising the concept of sustainability. This concept has been a buzz word in policy circles since the Bruntland report (WCE, 1987). However, it still remains an ideal, it has not been implemented. With the availability of natural resources values attempts can be made to capitalise and include them in National Accounts. This is an attempt to value natural resource as assets and include their depreciation in the same manor that man-made capital is treated in conventional accounts (Repetto, 1992).

3.4. Summary

This chapter discusses the crucial issue of inclusion of nonmarket values in an extended BCA. Economic value is important to decision makers in that it reduces everything to a common denominator and makes comparisons systematic. In this regard, the paper has argued that the application of

nonmarket valuation techniques and the need for nonmarket estimates is long overdue.

The proposed EIA legislation could provide the demand and the impetus for the incorporation of economic value of natural resources into public decision making. This legislation makes mandatory EIA on any major resource development project. The role of the Ministry of Environment and Tourism will be pivotal in ensuring that these guidelines are adhered to. If this mandate is exercised, it will lead to further testing and adapting the existing methodologies to suit the Zimbabwean context. This will not be easy in that there will be some people who will be sceptical of the accuracy of the methods. This is not unique to developing countries. In Australia, Bennet et al. (1993) reports that CVM evoked a great deal of controversy.

However, there are some additional constraints associated with the application of nonmarket valuation approaches. There is a lack of expertise and in developing countries to use these methods. In addition, there is lack of familiarity with these techniques. However, these problems can be overcome through training. Lastly, there is need for transparency, subjecting the process to independent appraisal and public consultation. This is not an indictment against valuation per se, but results can be subject to manipulation by pressure from interest groups and rent-seeking incentives of administrative structures.

CHAPTER 4: PAST CVM STUDIES IN DEVELOPING COUNTRIES:
A REVIEW AND THE WAY FORWARD

The previous chapter has set the operational framework for nonmarket valuation. The objectives contained in this chapter are to critically review some of the studies conducted in developing countries. It contains a review of 12 studies of CVM conducted in some developing countries (Table 3). Particularly, the review will focus on the procedures followed (WTP or WTAC, solicitation) and the validation approaches. The studies provide some empirical support for the application of CVM and their results will be used to draw lessons which could be used in further empirical work in developing countries.

4.1. Status of CVM in Developing Countries

The application of CVM in the developed countries has grown significantly during the past two decades. In the case of developing countries, its use has been limited (Whittington, 1990). In a recent survey of CVM, Carson et al. (1994), cites 1600 studies and of these only 20 were undertaken in developing countries. Only one study by Robinson (1988) was cited from Zimbabwe.

Most of the literature cited is dominated by use of CVM in evaluating the impacts of investments in public infrastructure such as water and sanitation. These studies were carried out in Nigeria (Whittington et al 1990, 1991), Ghana (Whittington et al. 1993), in Pakistan (Altaf et al. 1987), Brazil (Briscoe et al. 1990), Zimbabwe (Robinson, 1988), Haiti (Whittington, 1990), Ghana (Boadu et al. 1990) and Taiwan (Hsu and Li, 1990) to investigate demand for water services and WTP for improved services.

Table 3: CVM studies in developing countries

Author(s): Whittington,D., Donald,T Laurian, Albert,M Wright., K Choe., J.A Hughes and V Swarn.1993. Resource:Improved sanitation services Method:Abbreviated bidding Where:Kumasi, Ghana (urban) Sample size:1 200hh
Author(s): Briscoe, J., P. F de Castro., C Griffin., J North and O. Olsen.1990. Resource:Improved water services Method: Bidding games Where: Brazil (rural) Sample size:1 232 hh
Author(s): Boadu. F.O.1990. Resource:Improved water services (private and public taps) Method: Bidding games Where: Ghana (rural) Sample size:294
Author(s): Whittington,D., John Briscoe, X Mu. and W.1990 Resource: Water services (private or public taps) Method: Both open ended and Bidding games Where: Haiti (rural) Sample size:127 hh
Author(s): Whittington,D., A,Okobafor., A Okore and A. McPhailt. 1990. Resource:Water services Method: Abbreviated bidding games Where: Nigeria (rural) Sample size:395 hh
Author(s): Altaf, A., H. Jamal and D. Whittington. 1987. Resource:Improved water services Method: Bidding games Where: Punjab, Pakistan (rural) Sample size:1 261
Author(s): Whittington,D., Donald,T Laurian, and X M.1991. Resource:Water services Method: Bidding games Where: Onitsha, Nigeria (rural) Sample size:1 235 hh
Author(s): Whittington, McPhail Okore (1990) Resource:Water services Method: Bidding games Where: Nsukka, Nigeria (rural) Sample size:395 hh
Author(s):Hsu George J.Y and Wen-Yao Li.1990 Resource:Water quality Method: open ended Where:Taipei, Taiwan (urban) Sample size:186 hh
Author(s): Campbell, B ; Vermeulen, S, J and T. Lynam. 1991. Resource: Forest products Method: Direct and indirect scoring Where: Zimbabwe (rural) Sample size: 358 hh
Author(s):Shyamsundar,P and R.A. Kramer. 1993. Resource:Forest products Method: DC-CVM Where: Madagascar (rural) Sample size:1 232 hh

The motivation of these studies was the concern of donor agencies especially the World Bank, who were lending a lot of money for infrastructural programmes. They were concerned about the poor returns to their investment, hence they wanted information on household water and sanitation use in an attempt to generate information for future planning and policy. This further shows that application of nonmarket techniques is policy driven. Few studies have been applied in the environmental domain per se, such as benefits of water quality improvements (Hsu and Li, 1990) and forestry area (Campbell et al. 1991; Shyamsundar and Kramer 1993). The paper will present in some detail these two studies since they are in the forestry field.

Campbell et al. (1991) estimated the value of trees to communal area households by putting financial values to tree products using CVM. This was a first attempt in Zimbabwe to put monetary values to tree resources through a nonmarket valuation exercise. Recognising the problem of unfamiliarity with purchasing nonmarket goods, Campbell et al (1991) used an indirect scoring method to obtain values so as to compare with the direct WTP and WTAC results.

They showed the respondents ten cards representing different categories of products (household materials, ecological functions, fruit and food, etc) and asked them to rank them in order of importance. There were two extra cards which were unrelated to tree resources which were there for anchoring purposes. One was a type of a water pump and the other represented a common type of latrine (the Blair latrine). In the second stage, they gave the respondents 50 sticks of matches to distribute among the different cards reflecting their relative importance.

The first contingent question was direct, they asked

respondents WTP to install a borehole with a hand pump, which would be shared with four other households. The hypothetical market guaranteed finding the water, exclusive use of the borehole, interest free loan from Agricultural Finance Corporation (AFC) , a parastatal charged with financing farm projects. The repayments were to be made over five years through deductions of crop sales through a grain marketing board.

The second question was a WTAC if that borehole was destroyed in order to complete some development project. The last section consisted of a series of dichotomous choice questions involving choosing between having a borehole shared with four others and a series of five commodities decreasing in value from Z$35 000 to Z$90.

Values of the various groups were indirectly calculated through conversion using borehole equivalents, which were used as a common denominator. Farmers ranked direct inputs of woodfuel and materials, followed by inputs in other activities such as crop and animal production, ecological services and cash and lastly, shade, health and social services. The issue arising from this is that given the high ranking of materials, why are they not engaged in tree planting activities.

Another questionnaire was sent out to experts with the same questions, except the borehole and the latrine. They took this group as representative of "society". There were interesting results, between those of the households and those of the experts, depending on the area. For the high potential areas, experts ranked food, cash, ecological and social services higher than the farmers. Shade was ranked least by experts. The other categories had similar rankings. In contrast, in low potential areas, experts ranked cash, shade, crop, but food was ranked low.

An innovative study in Madagascar by Shyamsundar (1993) used CVM to value the loss in benefits to smallholder farmers of converting some forest areas into a National Park. The village households were offered use of buffer zones and in addition were asked in a CVM how much rice they would accept as compensation for the loss of forest lands. They used a dichotomous type question to elicit the amount of rice respondents were willing to accept as compensation. The rice amounts were varied across respondents.

The questionnaire contained several sections which dealt with the following; benefits derived from forests especially perceptions regarding environmental service functions of flooding and soil erosion, ancestral traditions, and future availability of forests. The questionnaire also collected data on socio-economic variables which were used as explanatory variables in the logistic regression analysis.

The results show that those people with higher harvests or more cultivable land per household (high income), were willing to forego use of the forest compared to those who were likely to have consumption deficits and had lower cultivable land (low income). These results are illuminating in two ways. First, they distinguish the behaviour of the poor, who are dependent on forest lands and the rich, who probably have alternatives. Second, the poor households are unwilling to forgo use of forest lands in that they heavily depend on them and probably perceive that the compensation is little. Therefore, it becomes important to identify those socio-economic factors likely to affect WTP or WTAC and the likely trade-offs between short- and long-term needs of the respondents.

4.2. Pertinent Issues in applying CVM

Two broad sources of problems have been identified by
practitioners as potentially affecting the efficacy of CVM.
Theoretical problems have been examined (Adamowicz et al.
1994; Hanemann, 1994), whilst empirical problems have been
dealt with by Mitchell and Carson (1989), Smith (1993) and
Cummings et al. (1984). Hanemann (1994) also suggests a list
of good practice to generate reliable results; avoid self-
administered surveys; using a probabilistic sample; building
quality control through the process of instrument development
and testing; making commodity realistic; making payment
credible; providing appropriate information; legitimising a
"no" response and using debriefing questions to probe
respondents perceptions and motives. (p9). These issues will
be dealt with briefly and examined in relation to studies
cited in this chapter.

4.2.1. Reliability and Validity

In their state of the art assessment of CVM, Cummings,
Brookshire and Schultze (1986) provide a comprehensive review
of bias and accuracy of CVM. The reliability and validity of
CVM is based on the belief that a "true" value for a given
public good exists and the role of CVM is to discover or
reveal this value. The observed value in a CVM context is
represented by WTP/WTAC reported by the individual. Any
divergence between the "true" value and the observed value
reflects biases or errors. Error is defined as deviation of
an observed value from an underlying "true" value. The bias
between these two measures can arise from random and
systematic errors.

Freeman (1993) provides a simple illustration of these biases.
For example, let Wti be the ith individuals true WTP and Wri
be the revealed WTP. Wt depends on size of environmental

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change being valued (q), income (Yi) and a vector of other socio-economic variables, Si.

$$Wti = Wti(q, Yi, Si)$$

The differences between Wri and Wti can arise from random error, systematic error, and the probability that Wri will actually be observed. Let these processes be represented by:

$$Wri = g\{wti(.), f1(.), f2(.), f3(.)\},$$

where g(.) aggregates the three sources of divergence between true and revealed values (Freeman, 1993).

Let the random error process be described by F1(X,a), where X is a vector of variables and, a, is a vector of parameters describing this process. The process reflects what was originally thought as a problem of accuracy (Freeman, 1979) and hypothetical bias (Rowe, d'Adrge and Brookshire, 1980, Schultze, d'Adrge and Brookshire, 1981, Cummings et al, 1986). However, this is a random error process and by definition, has zero mean, hence there is no bias.

Random errors occur in the process of selecting a sample, designing the survey and in the process of eliciting responses. This phenomenon is reflected by the size of the standard error of the mean reported value. The question of reliability is related to random error.

Systematic error includes those errors arising from the way the scenario is presented in the contingent market. It is described by F2(Wti, M, B), where M and B represent another set of variables and parameters describing this process. The process represented by f2(.) includes strategic behaviour, starting point bias, anchoring and implied value cues. These problems come under the problem of validity. If there is no systematic error, then;

$$E[Wri -Wti] = 0 \text{ for all i.}$$

Therefore the survey instrument is valid and the divergence of

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sample means of Wri and Wti are interpreted as coming from random error process and can be improved through increasing sample size or improving sample design (Mitchell and Carson, 1989).

Validity is defined as the degree to which an instrument measures the theoretical construct of interest (ie true WTP, true probability of yes, true ranking of alternatives and true changes in the levels of an activity. Systematic errors exist to the extent that there is nonzero difference between the expected values of reported WTP and "true' WTP. Thus validity is related to systematic error.

Last, the error related to the probability that Wri will actually be observed. It is described by f3(Wti, Z, Y), where Z and Y describe the process. The process represented by f3(.) includes sampling bias and item nonresponse bias. If the probability that Wri as observed is independent of Wti and of other individual characteristics, then the f3(.) process is not operative. These problems can be dealt with statistically and are not unique to CVM surveys only (Mitchell and Carson, 1989).

Sources of error/biases
The major sources of bias relate to the hypothetical nature of the approach and the public-goods nature of the commodities it is used to value. Public-goods nature is thought to induce strategic behaviour. Strategic biases arise from the opportunity for "free riding". If an individual perceives that he can benefit without paying or paying little, then that individual will state a lower WTP.

Research attempting to find evidence for strategic behaviour in CVM has proven unsuccessful (Thayer, 1981, Shultze et al. 1981; Bishop and Heberlein, 1979, Bishop et al. 1983). Smith

(1980) showed that in experimental public goods markets with weak incentives for preference revelation, most respondents accurately reported their personal valuations. Thus, empirical evidence tends to show that the extent of the problem was overstated (Bohm, 1972).

Of all problems, the hypothetical market problem seemed by far the most vexing (Cummings et al. 1986). There is no agreement on what it means, let alone how to resolve it. Rowe and Chestnut (1983) believe the bias arises "because respondents are predicting what their behaviour would be in a hypothetical situation"; Schulze et al, (1981) think it arises due the failure by respondents to understand all of the implications of a proposed environmental change; Bishop and Heberlien (1979)- "CVM elicits statements of attitudes rather than intended behaviour and that CVM is too artificial to providing sufficient context for developing accurate values".

The following biases fall under hypothetical bias; information bias, payment vehicle bias, framing effects etc. Hypothetical bias measures the influence of an artificial as against an actual market. Different results can be obtained by varying amount of information, payment vehicle or method of provision. Changes in conditions of CVM should not be taken as evidence of bias unless they are systematic (Hoehn and Randall, 1987), but should be regarded as legitimate effects of varying parameters of the contingent market (Asafu-Adjaye, 1989). These are random errors and thus should not be of much concern to a researcher since they can be eliminated or ameliorated with careful design of the survey.
Sample related errors arise due to failure to plan and implement an appropriate sampling design. For example, non-probability sampling where each member is not given an equal chance of being included or where a survey population does not match target population (sampling frame bias). Two other

sources of error are non-response and sample selection bias. Nonresponse errors arise when certain individuals do not respond to entire survey (unit nonresponse) or to a particular question (item nonresponse (Mitchell and Carson, 1989)).

Despite the fact that nonmarket value is unobservable, hence one may never be able to measure biases, tests of validity have been carried out comparing CVM results and results obtained through other methods (Eg TCM). Given that true value may never be known, these tests are not definitive and convergence of estimates obtained through different approaches does not translate into validity. This approach is not based on economic theory. Use of revealed preferences may be sound theoretically. Therefore, there is need for continued efforts in finding better tests of validity (Asafu-Adjaye, 1989).

Brookshire et al.(1976) first suggested visual inspection of bid distribution. They assumed that distribution of true bids is normal. Strategic behaviour would manifest itself through the presence of larger than normal bids at either or both ends of the distribution. This approach has been used extensively in the literature (Desvouges et al, 1981; Rowe et al, 1980; Schultze et al. 1981; This test is however, not definite. First, normality assumption may not hold since true bids may never be ascertained. Second, CVM bids pertain to an area under the demand curve. Third, nonmarket curve does not equate to bias. Bias could result in shifting the distribution to the left or right. In fact zero and outlier bids may represent genuine bids.

Elicitation procedure
The studies cited in this paper used a variety of bidding games to get the WTP. The bidding game was appropriate in the case of Nigeria and Ghana because that is the way business is conducted there (Boadu et al. 1990). In addition, respondents

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were familiar with the good being valued since they already engaged in purchasing of water.   In the case of the study in Zimbabwe (Campbell et al. 1991) and Madagascar (Shyamsundar, 1993), they used a mixture of direct and dichotomous questions.   DC-CVM has been shown to be simple and may provide the method for eliciting responses.

However, Adamowicz et al. (1994) argue that by asking individuals to respond to a CV question that proposes reduction in a communal resource, there is an implicit assumption that communal resources can be alienated or traded to maximise individual utility, which may not be possible. They further argue that individuals may not be clear as to how the proposed rights transfers will affect their individual utility.   For example, if individual always knew property as communal, the benefits of which are shared, then they may not be able to think of changes in terms of how their individual utility is affected.

Divergence between WTP and WTAC
By asking WTP/WTAC, implies different property rights and reference levels of utility.   The scenario presented reflects the implied property rights in the environmental change being valued.
For example, if the proposed change is a gain, WTP equals compensating surplus and it implies that individual has no property right in the increase of the good being valued.   This context implies that some other party has the property rights that entitles it to sell the resources.

Alternatively, if an individual is asked to state compensation required to forgo the improvement, it is implied that the individual has a property right in the improvement (Freeman, 1993).   WTP to avoid a loss is equal to equivalent surplus and is consistent with having property rights in the status quo.

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WTAC gives compensating surplus of welfare loss and implies that individual does have a property right in the status quo. In either case, the respondent may find the property assignment difficult to comprehend or simply understand.

If environmental improvement is being valued, then WTP is proper and reference utility is the status quo, but if question is to value cost under a legal requirement to assess damages or to compensate losers, then WTAC is proper. However, in empirical work, WTP and WTAC are not equal and in fact there are large discrepancies. In fact, empirical estimates have shown that typically WTAC is three to five times WTP and does not have a budget constraint (Rowe et al, 1980; Randall and Stoll, 1980; Knetsch and Sinden, 1987). WTAC may not be incentive compatible (Carson, 1991), hence respondents may state the highest amounts that can be extracted in compensation than the minimum compensation they would require.

Further evidence is unfolding and has shown that the differences are legitimate given the nature of the question and the context in which the good is being valued. Hanemann (1991) has shown that theory predicts large differences if the public good in question does not have a substitute market good. However, he fails to explain the persistent disparity in simulated markets involving common goods. For example lottery, coffee mug, pens (Knetsch and Sinden, 1987, Kahnemann, Knetsch and Thaler, 1990). As a result, the equality between WTP and WTAC is no longer widely accepted (Carson, 1991; Knetsch, 1990).

This controversy is on going. Carson (1991) argues that WTP is more appropriate if quantity or price change of a public good affects the same agents from both sides of the transaction. For example, if loss of a good resulted in an

increase in non-marketed benefits, which the respondents were willing to pay for.

Where appropriate and unavoidable, Mitchell and Carson (1989) have suggested the use of WTAC format in a closed ended referendum. For example determining the compensation required for local residents who are being asked to accept a locally unwanted land use (Freeman, 1993).

In all cases, respondents should be able to imagine; that the transfer of property rights could feasibly occur, how this transfer will affect their individual utility and, how that utility translates into some unit of currency. Any or all of the above conditions could be violated (Adamowicz et al, 1994).

Shyamsundar (1993) used WTAC because of the property rights which prevailed. They did a pretest which confirmed that people perceived the forest as theirs, so accepting compensation was more appropriate than WTP. In addition, during the pre-test, they found that within the hypothetical context, WTP would have given meaningless answers.

Campbell et al. (1991), used both WTP and WTAC and an indirect scoring method. Since this was a first attempt of valuation using CVM, they used these elicitation procedures to find out which could be suitable.

All the CVM studies on water and sanitation used WTP rather than WTAC. In these cases, it appears reasonable because they were dealing with a product for which people were already paying for in monetary terms.

The burden is now on the researcher to choose between WTP and

WTAC because choice of one has serious implications to policy (Knetsch, 1990). From where do we get the guidance?. This issue becomes important in a developing country context where the level of market development and cash transactions are limited. Asking WTP may be affected by severe budgetary constraints. In addition, the concepts of WTP or even WTAC may be alien.

These concepts are based on neoclassical concept of efficiency, where resources are allocated to the highest use. However, in developing countries, most households are poor and depend on the land for their livelihoods. Campbell et al (1991) raises an issue of the influence of wealth on WTP and the fear that policy may be dominated by the more wealthier groups. Their results show that experts valued economic roles, whilst smallholders valued social values . This may be a bias arising from strategic behaviour by experts (what they think should be done) versus smallholders (concerned they may have to pay).

Shyamsundar (1993) obtained similar results, where the high income households would willingly forgo use of the forest and allow the establishment of the park. It is the poor who are affected the most by this decision, hence their refusal to accept the compensation. In both studies, if decisions of the rich outweigh those of the poor, then resources may be reallocated in such a way that restricts access by poor to primary resources for survival.

In such cases, where policies may be concerned with equity, it would appear reasonable to use WTAC, rather than WTP. This would seem reasonable given that the smallholders perceive that they own the resource. Therefore, they treat changes in access as a loss.

Vehicle bias

Payment vehicle is important to reduce protest bids or biases. Mitchell and Carson (1989) suggest criteria for choice of appropriate vehicle; realism and neutrality. Generally, taxes of any form are resented by households. Hanemann (1994) identifies three kinds of issues; payment should be perceived to be linked to provision of the good, specify a certain context and mandatory payment once commitment has been made. This encourages respondents to take payment seriously.

All the studies on water and sanitation used increased user fees as a payment vehicle. This method seems reasonable given that households were already paying for services through fees and direct purchases. In the Campbell et al study, payment vehicle bias could have arisen from the use of Agricultural Finance Corporation as a source of the credit and its stop order system as a method of collecting this debt. In recent years, this corporation has become unpopular with smallholder farmers because most of them have defaulted on their loan repayments and it has resorted to selling some assets to recover the loans owed. In some cases it has deducted almost everything from the sale of grain through the stop order arrangement.

Method of Payment

In a developing country context, the choice of the numerarie is important if reasonable bids are to be obtained. Since monetary transactions may be small and erratic, use of an alternative measure which is widely used and understood may be reasonable. Robinson (1988) used money as the numerarie. The low WTP bids obtained could be a reflection of the inappropriateness of the numerarie because of budgetary constraints. Campbell et al. (1991) recognised that problem and used the scoring method to indirectly estimate value. Shymsundar used rice as the numerarie. In Zimbabwe, maize

could be used as the numerarie because people have experience in trading the good and also it is the main commodity distributed by government during drought years. Another study in progress, on rates of time preferences (Kundhlande per comm., 1994) is using maize and fuelwood as numerarie.

Aggregation

Valuation proceeds on the assumption that values obtained through identifying preferences of individuals in a group can be aggregated to reflect the value of that particular group (Adamowicz et al. 1994). Valuation is endogenous to a specific social environment reflecting the political, economics and property rights regimes. This determines whose interests count in the decision process related to the choices about the environment

In the study by Campbell et al. (1991), different ranking of the value of trees were obtained from experts and smallholder farmers. Experts (whom they took to represent society), ranked economic value more than smallholders did. Whose value should be taken present problems. This may be a bias arising from strategic behaviour by experts (what they think should be done) versus smallholders (concerned they may have to pay).

Values from CVM are endogenous to the type of property rights which are perceived by the respondent. Therefore these values vary with changes in perceptions of property rights.

4.3. Summary

The above overview shows that CVM has mostly been applied as a decision tool in infrastructural investments. It further discussed the controversy surrounding the efficacy of CVM. The sources of the biases are random and systematic. The focus for the development of CVM should be on systematic

sources since random errors by assumption are not a problem
and can be dealt with statistically. The results show that
CVM can be used in policy. However, it is dangerous to
generalise about developing countries. The procedure followed
ultimately depends on a case by case basis. Some methods will
be suited to some area, but alien in others. For example
bidding games may be unfamiliar to most Zimbabweans because
they have been conditioned to controls by government to the
extent that most prices were fixed and bargaining was not part
of the transaction. A DC-CVM may be appropriate because they
are familiar with the "take it or leave it" scenario. Money
can be used as the payment method if the population is
sufficiently used to using money regularly. For example
people in the urban areas pay for most goods an services using
money. In the rural areas, money income comes infrequently
and is characterised by low levels, probably one large lump
sum after harvest.

This chapter has thus attempted to show areas which need
particular thought when designing a CVM. This discussion
helps to show that CVM should be applied in a flexible
approach reflecting the socio-economic circumstances of the
respondents.

CHAPTER 5: CONCLUSIONS AND AREAS FOR FURTHER RESEARCH

5.1. Summary of major findings

This paper set out to review nonmarket valuation techniques and to explore the opportunities for use in developing countries. Chapter Two reviewed the main nonmarket valuation approaches, their theoretical underpinnings, strengths and weaknesses. The choice of the valuation approach will be determined on a case by case basis. Where recreational values are involved, TCM or CVM could be used, whereas where option and preservation values are involved, CVM may be the only method. HPM may have limited or no applicability in Zimbabwe. Land markets are inefficient and dominated by the public sector.

Further, it identified the operational framework in which nonmarket techniques can be used in decision making involving extended BCA. This was the subject of Chapter Three. It contextualised the main issues surrounding natural resource use and management. It provided further evidence for the rationale for economic valuation of natural resources and the context which may drive demand for such estimates. Particularly, the paper proposed that the EIA legislation which is in place, could provide the operational framework for nonmarket valuation and the impetus for the incorporation of economic value of natural resources into public decision making.

Most of the decisions on land use and conservation are driven by a different ideology, but recourse to an objective measure of value would establish trade-offs, which would potentially improve decision making and mediation of conflicts. Therefore any research agenda which ties itself to the needs of decision makers would find its efforts worthwhile. The areas which

urgently need valuation are; benefits of woodlands to the household economy, tourism through wildlife, environmental service flows.

Finally, it has demonstrated that CVM could potentially be used to some extent in developing countries. Chapter Four identified the studies which were conducted in developing countries and highlighted the constraints and opportunities of applying CVM. It reviewed CVM studies conducted in several developing countries. The review pointed out the peculiarities of developing countries and does not come out with broad generalisations. The procedure followed ultimately depends on a case by case basis. Some methods will be suited to some areas, but alien in others. For example bidding games may be unfamiliar to most Zimbabweans, because they were used to a market, where there was little room for bargaining. A DC-CVM may be appropriate because they are familiar with the "take it or leave it" scenario.

Money can be used as the payment method if the population is accustomed to using money. For example people in the urban areas pay for most goods an services using money. In the rural areas, money income comes infrequently and is characterised by low levels, probably one large lump sum after harvest. This discussion helps to show that CVM should be applied in a flexible approach reflecting the socio-economic circumstances of the respondents.

There is need for judicious application, given the differences in the degree of monetisation and distribution of property rights. In the absence of consideration of any values at all, value estimates from these techniques should be taken to be indicative of relative magnitudes, rather than the accurate valuation of the resource. Zimbabwe was used as an example, but most of the findings are pertinent to other developing

countries.

5.2. Areas for further research

This paper has shown that a variety of challenges confronting
efforts to make nonmarket valuation techniques contribute to
the policy process. Several of these issues have been dealt
with (Mitchell and Carson, 1989; Smith, 1993; Cummings et al.
1984). However, despite all the problems, Hoehn and Randall
(1987) make a pertinent observation regarding CVM that;
    "...CVM is a progressing research programme". (p228),
whilst Burness et al. (1983) on the same issue succinctly
concludes that:
    "Continued interest and research in this (the CVM) area
    are clearly warranted given, first the importance of the
    public goods issue and second, the lack of apparent
    alternatives to some form of the survey method in
    deriving valuations for large classes of public
    (environmental) goods". (p 6)

These observations lend further support for continued
improvements of CVM and nonmarket valuation in general. Non-
market valuation techniques have been applied to issues such
as recreation, environmental quality and wilderness
preservation. Demands for these services increase with
economic development. In developing countries, value could be
estimated on the basis of international tourism, because it
dominates the tourism industry. This information could aid in
pricing decisions.

The conditions facing most people in developing countries are
low incomes, poverty and unemployment. For this majority,
nonmarket valuations can be used in issues of development.
For example, it poses challenges in designing a plausible
market and payment vehicle. If a monetary measure is used,
WTP bids may be very low, whilst WTAC may be high reflecting

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what they would want to see done and perhaps marginal utility of money under severe budgetary constraints. It calls for modelling effort of household behaviour, especially how households make their valuations. In addition, it challenges researchers on how to structure CVM to obtain valuation responses.

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